

THE INVENTION CLAIMED IS:

1. A bypass orifice filter insert for use in a flush valve diaphragm, comprising:

a first body having ends, said first body defining an orifice;  
a flange attached to each end of said first body; and  
a second body attached to one of said flange, said second body defining a slit, wherein said slit of said second body is in fluid communication with said orifice in said first body.

2. The bypass orifice filter insert as claimed in claim 1, wherein said first body is annular shaped and said second body has a first diameter end that tapers to a second diameter end, wherein an outer diameter at the first diameter end is greater than an outer diameter at the second diameter end.

3. The bypass orifice filter insert as claimed in claim 1, wherein a first flange is attached to one end of said first body and a second flange is attached to an opposite end of said first body, said first flange and said second flange defining a recessed area therebetween.

4. The bypass orifice filter insert as claimed in claim 1, wherein said second body further defines a hole, and wherein said orifice in said first body is in fluid communication with said slit in said second body via said hole in said second body.

5. The bypass orifice filter insert as claimed in claim 1, wherein a width of said slit in said second body is in a range from 0.006 to 0.014 inch.

6. The bypass orifice filter insert as claimed in claim 1, wherein said first body and said second body are made from a unitary piece of molded material.

7. A diaphragm for use in a diaphragm-type flush valve, said diaphragm comprising:

a flexible diaphragm body having a first side and a second side and defining an outer periphery;

a center passageway defined in said diaphragm body;

an annular protrusion defined on said second side of said diaphragm body adjacent said center passageway; and

a plurality of protruding ribs having a first end and a second end defined on said second side of said diaphragm body adjacent said protrusion, said first end of said rib extending radially outward away from said center passageway toward said second end of said rib, said first end of said rib and said protrusion define a recess area therebetween,

wherein said second side of said diaphragm body is concave and said first side of said diaphragm body is convex when a pressure difference is applied across said diaphragm body, whereby a distance between said first end of said rib and said protrusion decreases.

8. The diaphragm as claimed in claim 7, wherein said diaphragm body further comprises an inner ring attached to said outer periphery of said diaphragm body, an outer ring, and a plurality of longitudinally-extending bands connected to said inner ring and said outer ring.

9. The diaphragm as claimed in claim 7, wherein said diaphragm body further defines an opening adapted to receive a bypass orifice filter insert.

10. The diaphragm as claimed in claim 7, wherein said first end of said rib extends axially outward away from said second side of said diaphragm body and tapers off toward said second end of said rib, thereby defining an L-shaped profile.

11. The diaphragm as claimed in claim 7, wherein said diaphragm body is annular shaped and made of a flexible polymeric material.

12. A flush valve diaphragm assembly for use in a flush valve, comprising:

a flexible diaphragm body having a first side and a second side and defining an outer periphery;

a center passageway defined in said diaphragm body; and

a bypass orifice filter insert mounted within said diaphragm body, said bypass orifice filter insert comprising a first body defining an orifice and a second body defining a slit attached to said first body, wherein said slit in said second body is in fluid communication with said orifice in said first body.

13. The flush valve diaphragm assembly as claimed in claim 12, wherein said diaphragm body further comprises an inner ring attached to said outer periphery of said diaphragm body, an outer ring, and a plurality of longitudinally-extending bands connected to said inner ring and said outer ring.

14. The flush valve diaphragm assembly as claimed in claim 12, wherein said first body of said bypass orifice filter insert is defined on said first side of said diaphragm body and said second body of said bypass orifice filter insert is defined on said second side of said diaphragm body.

15. The flush valve diaphragm assembly as claimed in claim 12, wherein said bypass orifice filter insert further comprises a first flange attached to one end of said first body and a second flange attached to an opposite end of said first body, said first flange and said second flange defining a recessed area therebetween.

16. The flush valve diaphragm assembly as claimed in claim 12, wherein said diaphragm body further comprises:

an annular protrusion defined on said second side of said body adjacent said center passageway; and

a plurality of protruding ribs having a first end and a second end defined on said second side of said diaphragm body adjacent said protrusion, said first end of said rib extending radially outward away from said center passageway toward said second end of said rib, said first end of said rib and said protrusion define a recess area therebetween,

wherein said second side of said diaphragm body is concave and said first side of said diaphragm body is convex when a pressure difference is applied across said diaphragm body, whereby a distance between said first end of said rib and said protrusion decreases.

17. A flush valve, comprising:

a valve body having an inlet and an outlet;

a barrel section having a sealing end positioned within said valve body, said sealing end defined between said inlet and said outlet, wherein said barrel section adapts to fluidly connect said inlet to said outlet; and

a diaphragm assembly positioned in said valve body and separating said inlet and said outlet, said diaphragm assembly configured to have a pressure difference applied across said diaphragm assembly, said diaphragm assembly comprising:

a flexible diaphragm body having a first side and a second side adapted to seal against said sealing end of said barrel section, said diaphragm body defining a center passageway and a bypass orifice filter insert spaced radially from said center passageway, wherein said bypass orifice filter insert comprises a first body defining an orifice and a second body defining a slit attached to said first body, wherein said slit of said second body is in fluid communication with said orifice in said first body.

18. The flush valve as claimed in claim 17, wherein said diaphragm body comprises:

an annular protrusion defined on said second side of said diaphragm body adjacent said center passageway; and

a plurality of protruding ribs having a first end and a second end defined on said second side of said body adjacent said protrusion, said first end of said rib extending radially outward away from said center passageway toward said second end of said rib, said first end of said rib and said protrusion define a recess area therebetween, wherein said recess area is adapted to receive said sealing end of said barrel section, and

wherein said second side of said diaphragm body is concave and said first side of said diaphragm body is convex when a pressure difference is applied across said diaphragm body, whereby a distance between said first end of said rib and said protrusion decreases as the diaphragm body is flexed, thereby causing said protrusion and said first end of said rib to squeeze against said barrel section thereby preventing said recess area of said diaphragm body from sealing too quickly against said sealing end of said barrel section.

19. A flush valve, comprising:

a valve body having an inlet and an outlet;

a barrel section having a sealing end positioned within said valve body, said sealing end defined between said inlet and said outlet, wherein said barrel section adapts to fluidly connect said inlet to said outlet; and

a diaphragm assembly positioned in said valve body and separating said inlet and said outlet, said diaphragm assembly configured to have a pressure difference applied across said diaphragm assembly, said diaphragm assembly comprising:

a flexible diaphragm body having a first side and a second side adapted to seal against said sealing end of said barrel section, said diaphragm body having a center passageway, an annular protrusion defined on said second side of said diaphragm body adjacent said center passageway, and a plurality of protruding ribs having a first end and a second end defined on said second side of said body adjacent said protrusion, said first end of said rib extending radially outward away from said center passageway toward said second end of said rib, said first end of said rib and said protrusion define a recess area therebetween,

wherein said recess area is adapted to receive said sealing end of said barrel section, and wherein said second side of said diaphragm body is concave and said first side of said diaphragm body is convex when a pressure difference is applied across said diaphragm body, whereby a distance between said first end of said rib and said protrusion decreases as the diaphragm body is flexed, thereby causing said protrusion and said first end of said rib to squeeze against said barrel section thereby preventing said recess area of said diaphragm body from sealing too quickly against said sealing end of said barrel section.

20. A method of compensating for a fluid pressure difference across a flush valve diaphragm separating fluid within a flush valve, the flush valve includes a valve body having an inlet and an outlet, and a barrel section having a sealing end positioned within the valve body, said sealing end defined between the inlet and the outlet, wherein the barrel section adapts to fluidly connect the inlet to the outlet, the method comprising the steps of:

a. providing a flush valve diaphragm assembly for use in a flush valve comprising a flexible diaphragm body having a first side and a second side adapted to seal against the sealing end of the barrel section, said diaphragm body comprising a center passageway, a bypass orifice filter insert spaced radially from said center passageway, an annular protrusion defined on said second side of said diaphragm body adjacent said center passageway, and a plurality of protruding ribs having a first end and a second end defined on said second side of said body adjacent said protrusion, said first end of said rib extending radially outward away from said center passageway toward said second end of said rib, said

first end of said rib and said protrusion define a recess area therebetween, wherein said bypass orifice filter insert comprises a first body defining an orifice and a second body defining a slit attached to said first body, wherein said slit of said second body is in fluid communication with said orifice in said first body;

b. positioning the flush valve diaphragm assembly in the flush valve between the inlet and the outlet of the flush valve;

c. applying a pressure difference across said diaphragm body such that the pressure on said first side of said diaphragm body is lower than the pressure on said second side of said diaphragm body; and

d. flexing said diaphragm body such that said second side of said diaphragm body is concave and said first side of said diaphragm body is convex wherein said recess area is adapted to receive said sealing end of said barrel section, whereby a distance between said first end of said rib and said protrusion changes as fluid flows through said bypass orifice filter insert.

21. The bypass orifice filter insert as claimed in claim 1, further comprising a recess defined in said first body in fluid communication with said orifice.